UNIVERSITI TEKNOLOGI MARA

ANALYSIS OF MICRO-DOPPLER CHARACTERISTICS OF PEDESTRIANS USING MULTIPLE-INPUT MULTIPLE-OUTPUT (MIMO) RADAR FOR ENHANCED TARGET DETECTION

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ABSTRACT

This paper presents a study on micro-Doppler characteristics of pedestrians using multiple-input multiple-output (MIMO) radar designed for automotive radar applications. The signals reflected might be similar in terms of reflecting angle and Doppler spread, between pedestrian and slow moving object. Hence, this study reports on the measurement and characterization of micro-Doppler signatures of the pedestrian in terms of Doppler spread contributed by multi-antenna measurement. The experiment is conducted in an anechoic chamber and laboratory, using continuous wave (CW) signal with the centre frequency of 4 GHz. A pair of ultra-wideband horn antenna is used as the radar sensors and positioned at different points along the baseline to produce pseudo-MIMO configurations. During the measurements, three types of targets are used – a moving object, a swinging ball and a pedestrian. Human target is studied in two motions, walking with swinging arms and walking without swinging arms. Results are analyzed using MATLAB software to generate corresponding Doppler spectrograms, Doppler histograms and Doppler spread analysis. The obtained results indicated the possibility of distinguishing micro-Doppler signatures between moving object and pedestrian by exploiting the difference in their Doppler spread information. Compared to single antenna configurations, wider Doppler spread is obtained when using MIMO configurations. Thus, outcomes from the MIMO configurations may help to improve the target classifications.

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